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EFFECT OF DIFFERENT RATES APPLICATION FROM ORGANIC MANURE AND SOME PLANTING METHODS ON QUALITY AND YIELD OF TARO *(Colocasia esculenta L. SCHOTT)*

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ABSTARCT

Two field experiments were carried out during the summer seasons of 2003 and 2004 on taro (local variety) in clayey loam soil at El-Zahraa, Mansoura, Dakhalia Governorate, Egypt. This investigation aimed to study the effect of farmyard manure levels (50, 60, 70 and 80 m^3/fed.) and planting methods i.e., heratey planting as new method and afier as a traditional method on vegetative growth parameters, yield attributes, taro quality and some chemical contents of corm. The results indicate that Heratey planting (new method) decreased the absent hills percentage by (40.9 and 36.75%) in both seasons respectively, compared with afier planting (traditional method).

Planting height, leaves number/plant, leaf area/plant, fresh weight of arial parts/plant, corms fresh weight/plant, corm length, corm diameter, total yield/fed, nitrogen, protein, dry matter and starch content in corm were increased by applying heratey planting method, whereas, dry weight of arial parts (%), average of corm weight, phosphorus, potassium, calcium and total oxalate concentration in corm were not significantly affected by either heratey or afeir planting methods during both seasons.

Application of farmyard manure at level (80m^3/fed) led to a significant increase In all vegetative growth parameters except the dry weight of parts, while, the percentage of an absent hills was not affected by different farmyard manure rates. Increasing farmyard manure application level up to (80m^3/fed) gave highest values of yield and its components, as well as gave a positive effect on corm contents from nitrogen, phosphorus, potassium, protein, dry matter, starch, calcium and total oxalate.

The interaction between planting methods and farmyard manure levels showed that applying heratey planting method with farmyard manure (80m^3/fed) gave the maximum values of vegetative growth parameters, total yield by (8.7 – 11.53%) and yield components, as well as, chemical contents and quality parameters of taro corm.

Generally, the results indicated that applying heratey planting as a new method with FYM at (80m^3/fed.) would increase the total yield and improve corm quality in addition to decrease the absent hills percentage/fed. and consequently led to decrease the total cost production/feddan.

INTRODUCTION

Taro (*Colocasia esculenta* L. schott) is produced commercially in 43 ountries worldwide, Egypt recorded the highest yield (34 - 9t/ha), FAO (1998). Otsubo (1996) reported that an international consumption rate of taro reached (3 kg/ person/year). Although, taro has been known in Egypt 2500 years ago (Marishta, 1998). The studies on taro crop in Egypt are not

efficient, specially concerning with methods of taro planting , this study was carried to evaluate the wet planting method (Heratey) as a new method of taro in comparison with dry planting method (Afeir) as a traditional planting method. Nassar *et al.* (1972 a) found that potato planting in wet soil (Heratey) showed significant increase in germination percentage, growth parameters and total yield compared with the planting in dry soil (Afeir). In the same trend, El-Moursi (1993) studied effect of planting methods on potato and found that (Heratey) method increased the germination percentage, plant height, average of tuber weight and total yield, whereas, there were no significant differences in dry matter and specific gravity of tubers .

Taro is one of the most vegetable crops requirement needs large amounts of organic manure. Organic manure is very important factor to improve the chemical and physical properties of soil, reducing pH and EC, increasing soil organic matter content and release nutrient elements (Salem, 1986). Wallace (1994) indicated that organic matter considered as a builder of better soil and create favorable biological reactions and life in the soil .

Application of organic manure quantities varied widely from place to place, the best management was at two portions , the first portion during land preparation and the second portion after (3 – 4) months later when the corm enlargement (FAO, 1999) .

Goto & Nagata (2000) and Thai & Vinh (2002) indicated that farmyard manure is an essential source to increase the soil fertility ; porosity of soil ; available (P), exchangeable (K), mineralizable (N), soil organic matter (OM) and increase both of vegetative growth and crop yield.

Taro cultivars differed in leaf area and dry weight of corms, the leaf area was positively correlate with total corms yield (Jacobs and Clark, 1993 and Waaijenberg and Aguilar, 1994).

Organic manure is so essential for good production,as proved by several investigators for example , Escalada and Rattila (1998) reported that green manure application of taro at rate of (7.23 and 10.84 t / ha.) promoted vigorous growth , resulting in large corms and higher total yield of corms . Onwueme (1994) ; Metwally (1996) and Aregheore and Perera (2003) ; recorded that the dry matter (DM) content ranged from 72 to 88.9% , crude protein (CP) content between 1.1 and 3.4% and starch content in carbohydrate from 65.9 to 77.9% of taro corm .

Several investigators carried out many researches to study the effect of organic manure on taro crop,for instance Susan *et al*, (2001) found that organic manure application before planting increased total yield relatively compared with inorganic fertilization.

El-Sharkawy *et al.* (2003), indicated that most parameters of taro i.e. vegetative growth characters, yield and yield components, starch, N, P, K and protein significantly increased with increasing of farmyard manure rates.

Taro raw utilizations are related to the presence of oxalate crystals which cause an irritation in the throat, thus corms must be cooked before eating to remove calcium oxalate (Vinning, 1995). Takebe (1999) illustrated that oxalate gives some vegetable an acrid taste and it's a possible cause of kidney stones in human being. Olivares *et al* (2002) found that higher level of free oxalate were correlated with lower total calcium concentration.

The present study was carried out to show the effect of planting methods and rates of farmyard manure application in clay loam soil at north delta region and their effects on growth, yield and some of corm quality characters.

Recently, developing countries become interested in organic agriculture for export to the foreign markets as well as the local market.

MATERIALS AND METHODS

Two field trials were carried out at El-Zahraa village. near Mansoura City, Dakahlia Governorate during the growing summer seasons of 2003 and 2004. Local cultivar (balady) of taro (*Colocasia esculenta* (L.) schott) was used for investigation the effect of different rates application from organic manure (FYM) and some planting methods on vegetative growth , quality and taro yield. The soil was prepared and supplied with 3/4 of FYM quantity as a 1st portion, whearas the 2nd portion was applied at 90 days after planting (DAP). A split plots design was used in three replicates. The planting methods were occupied the main plots as follows :

1)Traditional method (Afeir): the corm pieces planting in dry soil then irrigated immediately.

2) New method (Heratey): the corm pieces planting in wet soil in the suitable time of relative humidity (RH) of the soil.

Whereas, organic manure (FYM) at rates of 50, 60, 70 and 80 m^3/fed. were put as a subplots. The plot area was 16 m^2 which contained 4 rows , 5 m length and 0.8 m width . Seed corms were planted in hills 0.4 m apart and planted on 15 Mar. in both years.

Chemical fertilization with single suporphosphate, potassium sulphate and ammonium nitrate were added according to the recommendations. Other agricultural practices were applied as recommended by ministry of agriculture. Some physical and chemical properties of the experimental soil profile are as follows in table (1).

Table(1): Physical and chemical properties of the soil Delta at El-Zahraa, Dakahlia Governorate (Jackson, 1973).

Physical properties			Chemical properties		
Character	Depth		Character	Depth	
	0 - 20 cm	20 - 40 cm		0 - 20 cm	20- 40 cm
Sand %	33.8	35.0	Ec ds/ m(1:5)	0.63	0.65
Silt %	24.9	23.2	Soluble anions	Meq / 100 g soil	
Clay %	38.2	38.0	Co_3^-	0.0	0.0
Soil texture	Clay loam	Clay loam	Hco_3^-	2.05	2.0
O.M %	2.5	2.4	cl^-	0.3	0.32
$CaCo_3$ %	2.1	2.5	So_4^-	0.8	0.93
T.S.S	0.2	0.21	Soluble cations	Meq / 100 g soil	
PH	7.8	7.9	Ca^{++}	2.15	2.18
Bulk density%	1.18	1.15	Mg^{++}	0.35	0.37
Field capacity%	44.2	42.9	Na^+	0.2	0.32
Available water%	23.15	22.54	K^+	0.20	0.32
Wilting point%	20.55	20.22	Available N ppm	29	25
			Available P ppm	16	14
			Available K ppm	414	382

Data recorded

Data and observations concerning the characters under were determined as follows:

1) Growth parameters: An absent hills were calculated at 40 DAP.

A random sample of 3 plants were picked up from every experimental unit at 180 days after planting and the following data were recorded:

1- Plant height (cm).
2- Leaves number/plant.
3- Leaf area (cm^2) according to Watson (1952) formula.
4- Fresh weight of the vegetative parts/plant (g).
5- Dry weight of the aerial parts/plant (g).

2) Chemical parameters in corm at harvest:

1- N, P, K and Ca contents were determined according to Jackson method (1973).
2-Total protein content (%) was calculated by multiplying NX 6.25.
3-Starch content (%) was determined according to the method reported by Nelson (1974).
4-Dry matter (%) was determined by dried 100 g of corms on oven at 70°c for 48 h. to conestant weight (A.O.A.C, 1980).
5-Total oxalate was determined by the method of Dye (1956).

3) Yield at harvest:

1- Corms fresh weight/plant (g).
2- Average of corm weight (g).
3- Average length and diameter of corm (cm).
4- Total yield (ton / fed).

Statistical analysis:

The results were subjected to statistical analysis of variance and the least significant differences (L.S. D.) were calculated (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Vegetative growth character:

Data presented in Table (2) showed an influence of planting methods vz. (heratey) as a new or the traditional method (afier) on vegetative growth characters.

The results in Table (1) indicated that Heratey planting method of taro significantly decreased an absent hills percentage at 40DAP, the absent hills percentage in the two planting seasons were decreased by applying heratey method by (40.9 and 36.75%, respectively) in compared with afier method, this result may be due to planting of seeds at the suitable relative humidity of soil in the heratey planting method led to decrease of effect and role of decay bacteria, which activate in high humidity conditions of the soil.

Related data in Table (2) revealed that heratey method had positive effect on plant height, leaves number, leaf area and fresh weight of arial parts/plant during the two growing seasons, while the dry matter of arial parts (%) was not affected by any of both planting methods. Similar conclusions were reported by Nassar *et al.*, (1972a) and El-Moursi (1993) on potato crop.

Table (2) : Vegetative growth characters of Taro plants as affected by planting methods, farmyard manure and their interactions during seasons of 2003 and 2004.

Characters / Treatments		Absent hills at 40 DAP (%)		Plant height (cm)		Leaves number/ plant		Leaf area/plant (cm^2)		F.W. of aerial parts/plant (g)		D.W. of aerial parts (%)	
		S1	S2	S1	S2	S1	S1	S2	S2	S1	S2	S1	S2
Planting methods													
Heratey		09.75	09.33	109.33	116.00	4.11	4.36	743.83	856.08	796.75	815.33	12.742	13.058
Afier		16.50	14.75	105.17	106.67	4.08	4.29	725.08	793.58	671.42	685.25	12.650	12.833
LSD at 5%		02.01	02.50	002.82	07.30	0.11	N.S	N.S	002.01	017.51	026.10	N.S	N.S
Farmyard manure (FYM) levels:													
50 m^3/fed		12.17	11.33	097.00	101.83	3.82	4.03	705.50	790.67	699.83	729.83	12.950	13.033
60 m^3/fed		12.33	11.67	106.67	111.17	3.90	4.17	722.83	820.50	718.50	721.33	12.667	12.950
70 m^3/fed		13.67	12.17	111.00	115.17	4.27	4.43	749.50	836.00	758.33	773.50	12.583	12.900
80 m^3/fed		14.33	13.00	114.33	117.17	4.42	4.67	760.00	852.17	759.67	776.50	12.583	12.900
LSD at 5%		N.S	N.S	02.55	002.21	0.18	0.07	11.40	011.10	009.94	018.43	N.S	N.S
Interactions:													
Heratey	50 m^3/fed	10.00	08.66	099.33	105.33	3.83	4.07	705.33	824.67	746.67	794.33	13.000	13.167
	60 m^3/fed	09.33	09.33	108.00	115.67	3.90	4.13	732.33	854.33	779.67	771.33	12.700	13.100
	70 m^3/fed	09.67	09.33	113.33	120.00	4.30	4.50	762.33	865.33	830.67	847.00	12.633	13.000
	80 m^3/fed	10.00	10.00	116.67	123.00	4.43	4.73	775.33	880.00	830.00	848.67	12.633	12.967
Afier	50 m^3/fed	14.33	14.00	094.67	098.33	3.80	4.00	705.67	756.67	653.00	665.33	12.900	12.900
	60 m^3/fed	15.33	14.00	105.33	106.67	3.90	4.20	713.33	786.67	657.33	671.33	12.633	12.800
	70 m^3/fed	17.67	15.00	108.67	110.33	4.23	4.37	736.67	806.67	686.00	700.00	12.533	12.800
	80 m^3/fed	18.67	16.00	112.00	111.33	4.40	4.60	744.67	824.33	689.33	704.33	12.533	12.833
L.S.D. at 5%		N.S	N.S	003.61	3.131	0.26	N.S	01.64	015.70	014.06	11.24	N.S	N.S

The effect of FYM levels i.e 50, 60, 70 and 80 m^3/fed.on vegetative growth characters was presented in Table (2). The results indicated that highest level of FYM ($80m^3$/fed) recorded significant increase in the vegetative growth characters/plant i.e, plant height, leaves number, leaf area and fresh weight of arial parts/plant in both seasons of 2003 and 2004.These results are in agreement with those obtained by Onwume (1994); Metwally (1996); Escalada and Ratilla (1998); Goto and Nagata (2000); Thai and Vinh (2002), Aregheore and Perera (2003) and El-Sharkawy *et al.*,(2003).

Concerning methods and FYM levels, data in Table (2) indicated that heratey planting method with FYM level at ($80m^3$/fed.) had significant effects for all vegetative growth parameter except the fresh weight in the 2nd season and the dry weight of arial parts (%) in both seasons. Similar opinions were reported by El-Moursi (1993) and Escalada and Ratilla (1998).

Yield and its components:

Data in Table (3) illustrated clearly that heratey as a new planting method gave significant increase in corm fresh weight/plant, corm length, corm diameter and total yield of taro in both seasons, while, average of corm weight was not affected by the planting methods.

Results in (3) indicated the percentage of increment for heratey method in compared with afier method application were (10.2 and 9.28%) of corm fresh weight/plant and (8.33 and 10.28%) of total yield during planting seasons of 2003 and 2004, respectively. These results are in agreement with those obtained by Nassar (1972a) and El-Moursi (1993).

Table (3) :Yield and its components of Taro as affected by planting methods, farmyard manure and their interactions during seasons of 2003 and 2004.

Characters / Treatments		Corms fresh weight/plant (kg)		Average of corm weight (gm)		Corm length (cm)		Corm diameter (cm)		Total yield (ton/fed)	
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Planting methods :											
Heratey		1.662	1.742	629.08	662.33	10.72	10.94	10.40	10.63	13.218	13.621
Afier		1.508	1.594	620.16	644.59	10.44	10.58	10.13	10.29	12.217	12.387
LSD at 0.05		0.068	0.055	N.S	N.S	00.08	00.02	00.03	00.11	00.10	00.63
Farmyard manure (FYM) levels:											
50 m^3/fed		1.337	1.452	558.33	584.50	10.23	10.46	09.99	10.26	11.881	11.930
60 m^3/fed		1.462	1.540	609.33	629.33	10.36	10.55	10.11	10.32	12.430	12.780
70 m^3/fed		1.703	1.773	647.50	686.83	10.85	10.96	10.45	10.58	13.132	13.575
80 m^3/fed		1.838	1.908	683.33	713.17	10.89	11.09	10.49	10.67	13.427	13.732
LSD at 0.05		0.045	0.049	11.45	15.49	00.16	00.12	00.11	00.11	00.137	00.231
Interactions (P.M. & FYM):											
Heratey	50 m^3/fed	1.407	1.497	561.67	584.67	10.34	10.60	10.13	10.41	12.429	12.560
	60 m^3/fed	1.547	1.613	610.33	644.33	10.53	10.75	10.33	10.52	12.893	13.360
	70 m^3/fed	1.780	1.863	652.67	694.67	10.94	11.16	10.54	10.75	13.563	14.083
	80 m^3/fed	1.913	1.997	691.67	725.67	11.06	1.27	10.60	10.85	13.987	14.480
Afier	50m^3/fed	1.267	1.407	555.00	584.33	10.11	10.32	09.87	10.11	11.333	11.300
	60 m^3/fed	1.377	1.467	608.33	614.33	10.18	10.35	09.89	10.13	11.967	12.200
	70 m^3/fed	1.627	1.683	642.33	679.00	10.77	10.75	10.36	10.40	12.700	13.067
	80 m^3/fed	1.763	1.820	675.00	700.67	10.72	10.91	10.38	10.50	12.867	12.983
L.S.D. at 5%		0.06	0.07	16.20	21.91	00.23	00.16	N.S	00.16	00.24	00.33

P.M.= Planting methods

As for the effect of FYM levels, yield and its components i.e, fresh weight of corm/plant, average of corm weight, corm length, corm diameter and total yield of corms were significantly increased with increasing of FYM levels in the two seasons of 2003 and 2004. similar conclusions were obtained by El-Moursi (1993); Escalada and Ratilla (1998); Goto and Nagata (2000);Susan *et al.*, (2001); Thai and Vinh (2002) and El-Sharkawy *et al.*,(2003).

Data in Table (3) also, reveal that supplying heratey planting method with FYM at level of (80m^3/fed.) recorded a significant increase of all parameters of yield and its components, except the corm diameter in the 1st season. Applying heratey method was superior on afier method at the highest rate of FYM (80m3/fed.) by (8.70 and 11.53%) in both season, respectively. Similar opinions were reported by Escalada and Ratilla (1998); Goto and Nagata (2000);Susan *et al.*, (2001); Thai and Vinh (2002) and El-Sharkawy *et al.*, (2003).

Some chemical and quality parameters of corm:

Data presented in Table (4) show that nitrogen and protein percentage in dry matter of corms were increased by applying of heratey planting method, while, P (%) and K (%) were not significantly affected by applying the different planting methods in the two seasons. These results may be due to heratey planting method increase the nitrogen release from FYM faster than afeir planting method, in addition to release fast of nitrogen than P or K from FYM.

Table (4): Chemical contents of taro corms as affected by planting methods, farmyard manure and their interactions during seasons of 2003 and 2004.

Characters / Treatments		N (%)		P (%)		K (%)		Protein (%)	
		S1	S2	S1	S2	S1	S1	S2	S2
Planting methods									
Heratey		0.965	1.004	0.629	0.703	1.314	1.33	6.04	6.27
Afier		0.895	0.943	0.607	0.659	1.295	1.32	5.72	5.88
F. Test		0.061	0.077	N.S	N.S	N.S	N.S	0.29	0.21
Farmyard manure (FYM) levels:									
50 m^3/fed		0.860	0.917	0.508	0.612	1.173	1.16	5.38	5.73
60 m^3/fed		0.910	0.941	0.519	0.654	1.252	1.31	5.69	5.87
70 m^3/fed		0.950	0.988	0.689	0.745	1.368	1.38	5.94	6.17
80 m^3/fed		1.040	1.046	0.756	0.786	1.425	1.45	6.51	6.54
LSD at 5%		0.084	0.062	0.021	0.019	0.038	0.04	0.58	0.43
Interactions(P.M. &FYM):									
Heratey	50 m^3/fed	0.880	0.944	0.509	0.615	1.180	1.17	5.50	5.90
	60 m^3/fed	0.940	0.962	0.5 25	0.648	1.273	1.31	5.88	6.02
	70 m^3/fed	0.980	1.024	0.715	0.761	1.370	1.39	6.13	6.38
	80 m^3/fed	1.060	1.086	0.766	0.789	1.433	1.46	6.63	6.78
Afier	50 m^3/fed	0.840	0.890	0.507	0.609	1.167	1.15	5.25	5.55
	60 m^3/fed	0.880	0.920	0.513	0.660	1.230	1.30	5.50	5.72
	70 m^3/fed	0.920	0.952	0.663	0.729	1.367	1.38	5.75	5.95
	80 m^3/fed	1.020	1.012	0.746	0.783	1.417	1.45	6.38	6.30
L.S.D. at 5%		0.078	0.070	0.029	0.027	0.054	0.06	0.36	0.28

P.M. = planting methods

With respect to the effect of FYM levels, data in the same Table (4) indicate that N, P, K and protein percentage in corms were increased significantly with increasing of FYM levels in the two seasons. These results are in agreement with those obtained by salem (1986); Wallace (1994); Goto and Nagata (2000); Thai and Vinh (2002) and El-Sharkawy *et al.*,(2003).

The interaction between planting methods and FYM levels had also, significant effect on the percentage of N, P, K and protein in corms in both season. Similar results were mentioned by Goto and Nagata (2000); Thai and Vinh (2002) and El-Sharkawy *et al.*,(2003).

In Table (5) data show that heratey planting method application gave a significant increase in dry matter and starch of corms. The positive correlation between dry matter and starch well known and these results were good reflection to increase of fresh weight of arial parts of taro plants in both seasons by applying of heratey planting method. On the other hand calcium and total Oxalate (%) were not significantly affected by either heratey or afier in both seasons.

Concerning with the effect of FYM levels, dry matter, starch and calcium percentages were significantly increased by increasing ofFYM levels. These results are in accordance with those reported by Onwueme (1994); Metwally (1996); Aregheare and Perara (2003).

Table(5): Chemical contents and some quality parameters of taro corms as affected by planting methods, farmyard manure and their interactions during seasons of 2003 and 2004 .

Characters / Treatments		Dry matter (%)		Starch (%)		Ca (%)		Total oxalate (%)	
		S1	S2	S1	S2	S1	S2	S1	S2
Planting methods:									
Heratey		59.64	62.39	27.79	27.21	0.49	0.49	2.47	2.57
Afier		58.27	61.92	26.57	26.78	0.48	0.49	2.47	2.56
LSD at 5%		00.69	00.19	00.16	0.12	N.S	N.S	N.S	N.S
Farmyard manure (FYM) levels:									
50 m^3/fed		57.93	60.81	25.05	24.68	0.47	0.48	2.64	2.76
60 m^3/fed		58.67	61.97	26.32	26.32	0.48	0.49	2.56	2.61
70 m^3/fed		59.00	62.81	28.08	28.15	0.49	0.49	2.36	2.45
80 m^3/fed		60.22	63.02	29.27	29.68	0.49	0.50	2.35	2.44
LSD at 5%		00.47	00.32	00.31	00.53	0.01	0.02	0.04	0.04
Interactions (P.M. & FYM):									
Heratey	50 m^3/fed	58.40	61.33	25.60	24.80	0.47	0.48	2.64	2.76
	60 m^3/fed	59.52	62.19	26.77	26.87	0.48	0.49	2.56	2.61
	70 m^3/fed	59.85	62.87	28.63	28.57	0.49	0.50	2.36	2.44
	80 m^3/fed	60.78	63.17	30.17	30.33	0.50	0.50	2.35	2.46
Afier	50 m^3/fed	57.45	60.29	24.50	24.57	0.47	0.47	2.63	2.76
	60 m^3/fed	57.83	61.75	25.87	25.77	0.48	0.48	2.55	2.60
	70 m^3/fed	58.15	62.76	27.53	27.73	0.48	0.49	2.36	2.45
	80 m^3/fed	59.66	62.87	28.37	29.03	0.49	0.49	2.35	2.41
L.S.D. at 5%		00.68	0.42	0.48	00.74	N.S	N.S	0.05	0.05

P.M.= Planting methods

Total Oxalate crystals- which cause an irritation and an acridity taste of corms before cooking- was significantly decreased by increasing of FYM levels. Data indicated that the higher level of total oxalate was correlated with lower calcium percentage (Vinning, 1995; Takabe, 1999 and Olivares *et al*, 2002).

As for the effect of the interaction between planting methods and FYM levels, the results indicated heratey planting method with FYM at 80 m^3/fed increased dry matter and starch. Meanwhile, afeir planting method at high rate of FYM (80 m^3/fed.) recorded the lowest value of total oxalate percentage in taro corms, while calcium was not affected by the interaction between planting methods and FYM levels.

Conclusion

In conclusion, this study demonstrated that it is possible to produce high taro yield with high quality by applying heratey planting as a new planting method with farmyard manure at rate of 80 m^3/feddan.

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تأثير إضافة معدلات مختلفة من السماد العضوي وبعض طرق الزراعة على الجودة والمحصول في القلقاس

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أجريت هذه الدراسة في تجربتين حقليتين خلال موسمي الزراعة الصيفية ٢٠٠٣ و ٢٠٠٤م على القلقاس (صنف محلي) في أرض طميية بالزهراء- المنصورة- محافظة الدقهلية- مصر.

تهدف هذه التجربة إلى دراسة تأثير معدلات من السماد البلدي (٥٠، ٦٠، ٧٠، ٨٠م٣/فدان) ، وكذلك طريقتي زراعة هما الزراعة الحراتي (كطريقة حديثة)، و الزراعة العفير (كطريقة تقليدية) على قياسات النمو الخضري وصفات المحصول وجودة كورمات القلقاس وبعض المكونات الكيمائية للكورمة. وقد أوضحت النتائج أن الزراعة الحراتي (الطريقة الجديدة) قللت من نسبة الجور الغائبة بحوالي (٤٠,٩ ، ٣٦,٧٥٪) في كلا الموسمين على التوالي مقارنة بالزراعة العفير (الطريقة التقليدية). أدى إستخدام طريقة الزراعة الحراتي إلى زيادة طول النبات، عدد الأوراق للنبات ، المساحة الورقية/نبات ، الوزن الطازج للأجزاء الهوائية/نبات ، الوزن الطازج للكورمات/ نبات، طول الكورمة ، قطر الكورمة ، المحصول الكلي/فدان، محتوي الكورمة من النتروجين، البروتين، المادة الجافة والنشا بينما لم تتأثر معنوياً نسبة المادة الجافة للأجزاء الهوائية ، ومتوسط وزن الكورمة، ومحتوى الكورمة من الفوسفور، والبوتاسيوم والكالسيوم، والأكسالات الكلية وذلك بأي من الطريقتين الحراتي أو العفير خلال موسمي الدراسة.

أدي استخدام السماد العضوي بمعدل ٨٠م٣/فدان إلى زيادة معنوية فى جميع قياسات النمو الخضري ما عدا الوزن الجاف للأجزاء الهوائية، بينما لم تتأثر نسبة الجور الغائبة بمعدلات السماد العضوي المختلفة.

سجل التسميد العضوي بمعدل ٨٠م٣/فدان أعلى قيم للمحصول ومكوناته كما أعطى تأثير ا موجبا على محتوى الورقة من النتروجين ، الفوسفور، والبوتاسيوم ، والبروتين، والمادة الجافة، والنشا، والكالسيوم، والأكسالات الكلية.

أوضح التأثير التفاعلي بين طرق الزراعة ومستويات التسميد العضوي أن إستخدام طريقة الزراعة الحراتي مع السماد العضوي لمعدل ٨٠م٣/فدان قد أعطى أعلى قيم قياسات النمو الخضري، المحصول الكلي بزيادة قدرها (٨,٣- ١١,٥٣٪) عن مثيله ومكونات المحصول، وكذلك المكونات الكيماوية وقياسات الجودة لكورمة القلقاس.

بصفة عامة، أوضحت النتائج أن استخدام الزراعة الحراتي كطريقة جديدة مع التسميد العضوي بمعدل ٨٠م٣/فدان سيزيد المحصول الكلي ويحسن من جودة الكورمة بالإضافة إلى تقليل نسبة الجور الغائبة في الفدان والتي بالتالي تؤدي إلى تقليل تكلفة الإنتاج الكلية للفدان.